

Section II (Remarks)

A. Summary of Amendment to the Claims

By the present Amendment, claims 1 and 4 have been amended and claims 2 and 3 have been cancelled. No new matter within the meaning of 35 U.S.C. §132(a) has been introduced by the foregoing amendments.

The amendments made herein are fully consistent with and supported by the originally-filed disclosure of this application.

B. Replacement Drawings

In the Office Action mailed August 19, 2009 the examiner objected to the drawings as originally filed in the application. Specifically Figs. 23-26 were alleged to be “poor reproductions and...not suitable for publication.” In response, enclosed and submitted herewith are three (3) pages of replacement drawings (inclusive of Figs. 23-26) in substitution of drawing sheets 19/21, 20/21 and 21/21 as originally filed in the application. In compliance with USPTO requirements, the enclosed drawing sheets have been labeled in the header with the legend “REPLACEMENT SHEET.”

Acknowledgement of the drawings as acceptable is respectfully requested.

C. Rejection of Claim Under 35 U.S.C. §112, Enablement

In the Office Action mailed August 19, 2009 the examiner rejected claims 1-4 and 6-8 under 35 U.S.C. §112, first paragraph as lacking enablement. Applicants respectfully disagree.

A determination of enablement under 35 U.S.C. §112, first paragraph is based on an evaluation of whether the disclosure, when filed, contained sufficient information regarding the subject matter of the claims as to enable one skilled in the relevant art to make and use the claimed invention without “undue experimentation.” Applicants assert that the disclosure of the present application is so enabling. It is the examiner’s position that the claimed invention is not supported by an enabling disclosure in view of the *Wands* factors.

The examiner's attention is respectfully drawn to the amended claims as set forth above. The claims that were elected in response to the March 23, 2009 Restriction Requirement were claims 1-4 and 6-8, classified as Group 1 and drawn to an *SGR* gene encoding a polypeptide. These are the claims currently pending and under examination. As amended, independent claim 1 recites an *SGR* gene encoding a polypeptide selected from SEQ ID NO: 30-58. The gene is characterized by the recited characteristic of encoding a polypeptide that induces leaf yellowing by participating in chlorophyll catabolism.

In support of the rejection for lack of enablement the examiner made the statement that "Applicants do not teach a delay in senescence." (Office Action mailed August 19, 2009, p. 3). Applicants' claims do not recite a delay in senescence. As the examiner has acknowledged, plant senescence is a complex process. The claims of the present invention relate to a gene identified as relevant in the process of leaf yellowing. By mutation of the gene, the process of leaf yellowing can be inhibited, though plant senescence continues. The claimed invention does not recite delay of plant senescence, related to the achievement of maintaining greenness during plant senescence.

Accordingly, the determination of enablement with respect to the *Wands* factors should be based upon the elements recited in the claims.

Example 2 of Applicants' demonstrates that of various phenotypic traits evaluated "except for the stay-green trait, various agronomic characteristics of the mutant were similar to the wild type" (p. 15). This demonstrates that mutation of the *SGR* gene leaves other phenotypic traits intact.

Applicants identified SEQ ID NO: 30 and further identified the conserved domain at residues 49-207 (Example 8; original claims). Applicants then identified genes from various plants, where the genes have high homology with the *SGR* gene and the amino acids they encode have high homology to SEQ ID NO: 30 (Example 9, Table 2).

In the allegation of lack of enablement, the examiner characterized Applicants' invention as "teach[ing] reduced *SGR* gene expression in *Arabidopsis* transformed with an *Arabidopsis* RNAi *SGR* silencing construct and a slight increase in the length of leaf greenness" (Office Action mailed August 19, 2009, p. 3). This is specifically shown in Example 10 of the application and provides support for the claimed invention, demonstrating that mutation of a *SGR* gene resulted

in increased green color being observed. Contrary to the examiner's assertion that the examples shows a slight increase, it is provided in the Example that "...the leaf greenness of T1-1 lasted much longer than that of the control..." and "...confirming that if *SGR* gene expression level is diminished, leaf greenness and freshness of leaves remains much longer..." (Specification p. 29-30; emphasis added.)

In the specification, Applicants have therefore shown SEQ ID NO: 30 to be an amino acid encoded by a *SGR* gene, identified the regions thereof and determined a conserved portion. Applicants have further identified sequences with homology to SEQ ID NO: 30, as set forth in Table 2 and in the sequence alignments of Figs. 16, 17 and 18. Applicants have provided all of SEQ ID NOs: 30-58 and an identification of the source of each in Table 2. Applicants have shown the effect of mutation of *SGR* genes and confirmed that diminishing *SGR* gene expression results in leaves remaining green for longer.

At the time of filing of the present application, it was well known in the art that the properties of "stay green" and senescence are separate properties.

The examiner's attention is respectfully drawn to the references provided as Exhibits A¹ and B² hereto, which both demonstrate that, due to a mutation in a stay-green (*SGR*) homolog, chlorophyll degradation does not occur in green-fresh (*gf*) mutants during leaf senescence and tomato fruit ripening (Exhibit A, Figs. 2 and 5) or in a chlorophyll retainer (*cl*) mutant during pepper fruit ripening (Exhibit B, Fig. 1).

Further the examiner's attention is respectfully drawn to Exhibits C (Figs. 1, 2 and 8)³ and D (Fig. 3)⁴ hereto, which demonstrate that the stay green mutant *yy* in *Festuca prantensis* shows a stay green phenotype.

¹ Barry CS, McQuinn RP, Chung MY, Besuden A, Giovannoni JJ (2008) Amino acid substitutions in homologs of the STAY-GREEN protein are responsible for the green-flesh and chlorophyll retainer mutations of tomato and pepper. *Plant Physiology* 147:179-187.

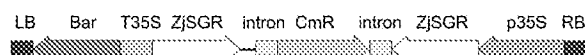
² Borovsky Y, Paran I (2008) Chlorophyll breakdown during pepper fruit ripening in the chlorophyll retainer mutation is impaired at the homolog of the senescence-inducible stay-green gene. *Theor. Appl. Genet.* 117: 235-240.

³ Sato Y, Morita R, Nishimura M, Yamaguchi H, Kusaba M (2007) Mendel's green cotyledon gene encodes a positive regulator of the chlorophyll-degrading pathway. *Proc Natl Acad Sci USA.* 104:14169-14174.

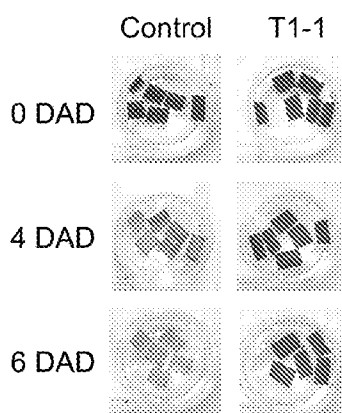
Exhibits A-D together demonstrate that a mutation in an *SGR* homolog in various plants prevent chlorophyll degradation in leaf senescence and/or fruit ripening, thus demonstrating the unique characteristic of the stay-green phenotype. Exhibits A-D are provided for the examiner's reference in demonstration of the knowledge in the art that "stay green" and senescence are separate properties. The references provided therein are not provided in IDS form, as the filing date of Applicants' application predates such references.

In Applicants' specification SEQ ID NO: 23 provides the sequence of an *SGR* DNA homolog (ZjSGR) derived from *Zoysia japonica* grass. Using this sequence, in accordance with the method of Example 10, an *Arabidopsis* stay-green transgenic plant and stay-green grass was obtained using RNAi gene silencing method. The results are provided below, where (a) provides a map of the RNAi gene silencing vector for ZjSGR and (b) demonstrated the results of retardation of chlorophyll degradation in T1-1 transgenic *Zoysia* grass during dark-induced senescence:

(a)



(b)



⁴ Armstead I, Donnison I, Aubry S, Harper J, Hörtensteiner S, James C, Mani J, Moffet M, Ougham H, Roberts L, Thomas A, Weeden N, Thomas H, King I (2006) From crop to model to crop: identifying the genetic basis of the stay-green mutation in the *Lolium/Festuca* forage and amenity grasses. *New Phytol.* 172: 592-597.

The T1-1 was a transformant in which the expression of gene was the most suppressed among 54 RNAi transformants. The leaf of T1-1 was cut and subjected to dark-induced senescence for 6 days. As a result, it was confirmed that the chlorophyll degradation was significantly delayed. This additionally shows the efficacy of suppression of expression of a *SGR* DNA homolog on prolonging green effects.

Based on the foregoing, the subject matter of claims 1-4 and 6-8 meets the enablement requirements of 35 U.S.C. §112, first paragraph. Withdrawal of the rejections of claims 1-4 and 6-8 under 35 U.S.C. §112, first paragraph is respectfully requested.

D. Comment on species election

In the Office Action mailed August 19, 2009 the examiner commented that “claims 1-4 and 6-8 are deemed free of the prior art given the failure of the prior art to teach or suggest an *SGR* encoding polynucleotide of SEQ ID NO: 1 and transformed plants thereof.” (Office Action mailed August 19, 2009, p. 4.)

In Applicants’ response mailed April 23, 2009, SEQ ID NO: 1 was elected in response to the examiner’s requirement of a species election within elected Group I claims (claims 1-4 and 6-8, drawn to an *SGR* gene encoding a polypeptide). A species election requires the election of a species of a generic claim. Applicants, under the requirements of 35 U.S.C. §121, elected a single disclosed species, with traverse, which the examiner has examined and found to be free of the prior art.

It is understood that in a species election, if any species is found to be allowable, that an additional species will be examined, until all species have been examined. Accordingly, Applicants respectfully renew the request that examination of additional species of the generic claim, *i.e.*, all *SGR* genes of SEQ ID NOs: 1-29 be conducted.

E. Request for Rejoinder

In the event that the restriction requirement between the composition and method aspects of the invention is made final, Applicants responsively request rejoinder of method claims 10-12, 15, 18-20, 24-26, and 32-34, under the provisions of MPEP §821.04 upon confirmation of allowable subject matter of the composition claims 1-4 and 6-8.

CONCLUSION

Based on the foregoing, all of Applicants' pending claims 1-4 and 6-8 are patentably distinguished over the art, and in form and condition for allowance. The examiner is requested to favorably consider the foregoing, and to responsively issue a Notice of Allowance.

This responds to the August 19, 2009 Office Action in the above-identified application. The time for responding to the August 19, 2009 Office Action without extension was set at three months, or November 19, 2009. Applicants hereby request a one month extension of time under 37 CFR § 1.136 to extend the deadline for response to December 21, 2010. Payment of the extension fee of \$65.00 specified in 37 C.F.R. § 1.17(a)(1), as applicable to small entity, is being made by on-line credit card authorization at the time of EFS submission of this Response. Should any additional fees be required or an overpayment of fees made, please debit or credit our Deposit Account No. 08-3284, as necessary.

If any issues require further resolution, the examiner is requested to contact the undersigned attorney at (919) 419-9350 to discuss same.

Respectfully submitted,

/steven j. hultquist/
Steven J. Hultquist
Reg. No. 28,021
Attorney for Applicants

/kelly k. reynolds/
Kelly K. Reynolds
Reg. No. 51,154
Attorney for Applicants

INTELLECTUAL PROPERTY/
TECHNOLOGY LAW
Phone: (919) 419-9350
Fax: (919) 419-9354
Attorney File No.: 4240-145

Enclosures:
Replacement Figures 23-26
Exhibits A-D

<p>The USPTO is hereby authorized to charge any deficiency or credit any overpayment of fees properly payable for this document to Deposit Account No. 08-3284</p>
